Issued April 15, 1907.

ALASKA AGRICULTURAL EXPERIMENT STATIONS,

C. C. GEORGESON, Special Agent in Charge.

BULLETIN NO. 3.

HAYMAKING AT KENAI EXPERIMENT STATION.

BY

P. H. ROSS,

Assistant at Kenai Station.

UNDER THE SUPERVISION OF
OFFICE OF EXPERIMENT STATIONS,
U. S. DEPARTMENT OF AGRICULTURE.

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ALASKA AGRICULTURAL EXPERIMENT STATIONS, SITKA, KENAI, COPPER CENTER, AND RAMPART.

[Under the supervision of A. C. True, Director of the Office of Experiment Stations, United States Department of Agriculture.]

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LETTER OF TRANSMITTAL.

ALASKA AGRICULTURAL EXPERIMENT STATIONS,
Sitka, Alaska, March 6, 1907.

SIR: I transmit herewith a manuscript on haymaking at the Kenai Experiment Station, by Mr. P. H. Ross, the superintendent of that station, and recommend that it be published as Bulletin No. 3 of the Alaska Experiment Stations.

The climate of the coast region is so rainy and damp that the pioneer often experiences great difficulty in curing his hay; in fact, haymaking in that region is considered by many to be well-nigh impossible, and it is therefore hoped that the experience at the Kenai station, as described herein by Mr. Ross, may be an aid to those who attempt to make hay under those conditions.

At the Sitka Experiment Station, where the number of rainy days are even greater than they are at Kenai, excellent hay has also been made from native grasses on several occasions by following practically the same methods which Mr. Ross found to serve the purpose best. Hay can be made successfully throughout the whole region by taking advantage of the occasional periods of fair weather. It can not, however, be made on an extended scale by cutting down large areas at a time, as is usually done under more favorable climatic conditions. The area which can be successfully handled depends, of course, on the amount of labor that is employed, but usually it will be found safest to mow comparatively few acres at a time.

Respectfully,

C. C. GEORGESON,
Special Agent in Charge of Alaska Experiment Stations.

Dr. A. C. TRUE,
Director, Office of Experiment Stations,
U. S. Department of Agriculture, Washington, D. C.

Recommended for publication.
A. C. TRUE, *Director.*

Publication authorized.
JAMES WILSON,
Secretary of Agriculture.

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INTRODUCTION.

During the haymaking season the weather along the Alaskan coast is generally so unfavorable, with prolonged intervals of rain, a sun whose beams are daily growing weaker, and shortening hours of work, that the statement has often been made that the curing of hay in Alaska is impossible. A study of the weather record seems to confirm this statement. There are three conditions, however, applicable to the Cook Inlet region (and it is believed the first two at least will apply to the whole coast region) that tend to simplify the task of hay curing.

First. The manner of precipitation. The rains are never dashing, but fall for the most part in a gentle drizzle. Owing to this, an ordinary cock of hay will withstand a long siege of rainy weather without becoming wet except for a distance of 3 or 4 inches from the surface.

Second. The low temperature, which allows green or damp hay to remain in the cock for several days without heating or molding.

Third. The southwest winds. The winds are always dry, of high velocity, and blow continuously night and day for three or four days at a time, thereby preventing dew and frost. These winds are more effective than the sun as a drying agent at this time of year. As a clear sky is almost without exception contemporary with a southwest blow, the value of these winds in haying time can be appreciated.

Since the inauguration of the work at this station in 1899 the stock belonging to the station have been fed nothing but native feed. This has consisted almost exclusively of hay, and enough of it has always been cured to winter the stock comfortably. During the last two years the station has had about 25 acres under cultivation, and the bulk of this has been given over to growing grain hay. Special attention has been paid to hay curing during this time, and the following notes and deductions therefrom are written in the belief that they will be of practical value to the Alaska pioneer.

IMPLEMENTS USED IN HAYMAKING.

This bulletin embraces the work of 1905 and 1906. During the former year the only labor-saving devices used were a mower and a homemade horserake. The use of these were confined entirely to the work on grain hay. The ground on which the native hay grows is so rough that nothing but hand tools can be used on it. The homemade horserake, though a time saver, did not do the work thoroughly, and hand raking was necessary to complete the operation. The only vehicle used in hauling the hay was an ordinary ox cart. In 1906 a 10-foot, self-dump horserake was used (Pl. I, fig. 1) which, with the mower, permitted of the work being done thoroughly and rapidly, thereby multiplying the chances of success. The secret of success in haymaking is the rapid performance of a large amount of work at the proper moment. A hay tedder could be used to good advantage. After the mower the hay falls together more or less compactly, and stirring it so that it will lie more loosely permits the free passage of the air and materially aids in the curing process. The stirring can be very effectively done with a hand fork, but this method is necessarily slow, which is a very serious objection. This method is the only one that has been used here, however, and in all cases where better methods are not available it will pay to use the fork.

CURING QUALITIES OF NATIVE AND OAT HAY.

All cuttings of hay mentioned herein are either oat hay or native hay (*Calamagrostis langsdorfii*), with the single exception of one cutting of barley. The oat hay grew rank, reaching a height of from 3 to 5 feet. The stalks were thick and heavy, and under the most favorable conditions would have required a long time to cure. All the oat hay was in the milk stage when cut both seasons.

The native grass, while from 3 to 4 feet high, has a slender stalk and is comparatively easy to cure. The cuttings of native hay mentioned below are located at some distance from the station; the first, 3 miles; the second, 6 miles, and are difficult of access on account of intervening water. Owing to this fact it was next to impossible to cure the native hay; the labor could not be applied at the proper time.

EXPERIMENTS IN 1905.

In the experimental cuttings described below no definite conditions were imposed, but methods were adapted to circumstances, and in each case the most feasible thing was done to save the hay. All yields given are approximate, as there were no scales on which to weigh the hay.

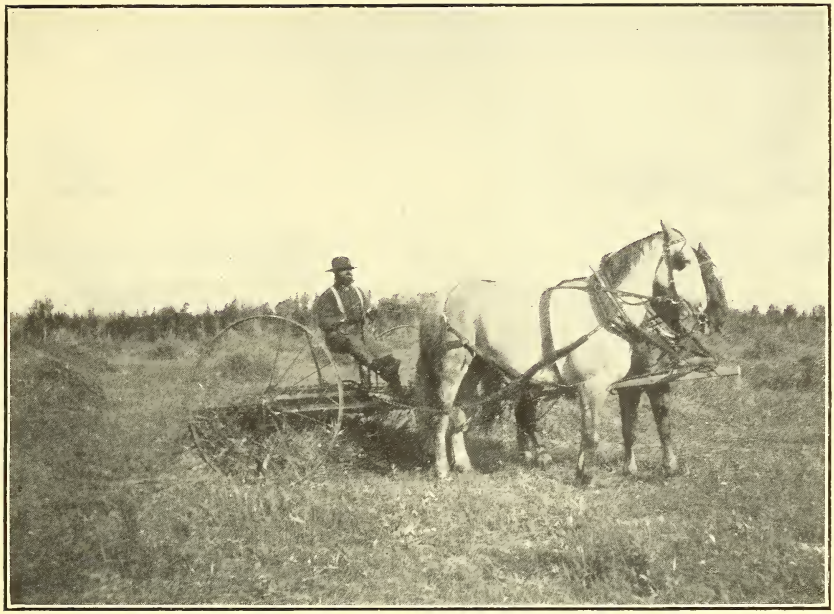

FIG. 1.—RAKING GRAIN HAY, KENAI STATION.

FIG. 2.—GRAIN HAY, KENAI STATION.

Plat No. 1.—Native hay cut with scythes July 25, 1905. The area cut over was about three-quarters of an acre, and the total yield amounted to approximately 1 ton. The hay was thrown into cocks the day after it was cut—some of it the same day. Stacked July 28 in two small stacks. The rainfall after cutting and before cocking amounted to but a trace: between stacking and taking to the hay shed, August 4, the rainfall was 1.5 inches. A portion of the hay on top of each stack was spoiled, but this was a negligible quantity. The remainder was in excellent condition, and remained so after being placed in a permanent stack in the barnyard. Time on the field before being hauled to hay shed, ten days.

Plat No. 2.—This cutting was oat hay, and was cut September 5 and 6. The area was 3½ acres, and the yield was estimated at 1 ton to the acre. The hay was tedded on September 8, and raked and cocked on September 9 and 10. Remained in the cock until hauled, September 21. It had cured perfectly and was stowed away in the hay shed in excellent condition and did not become moldy or discolored. There was no rainfall after cutting and before cocking; while in the cock before hauling 0.76 inch of rain fell. The number of days on the field after cutting was sixteen. The conditions in this experiment were unusually favorable.

Plat No. 3.—This was barley hay over an area of 3 acres. It was cut September 6 and 7, and yielded less than 1 ton to the acre. It was tedded on September 9 and placed in cocks September 10. It remained in the cock until hauled, September 22 and 23. The stand was thin and the stalks were slender—curing easily and quickly. The hay was stowed away in the hay shed and kept in perfect condition. There was no rainfall after cutting and before cocking. After cocking and before hauling there was 0.76 inch. The hay was on the field after cutting fifteen days. Some of this hay is in the hay shed at the present time, and is as bright and clean as the day it was cut.

Plat No. 4.—An area of 6 acres of oat hay; yield, 1 ton to the acre. Cut September 8 and 9. A portion of the hay was thrown into cocks September 11, but a shower of rain prevented completion. This was thrown out again the next morning and the remainder tedded. Placed in cocks September 13. Remained in cock until hauled, September 28. Rainfall after cutting and before cocking, 0.02 inch; after cocking, before hauling, 0.74 inch. On field after cutting, nineteen days. Stowed in the hay shed in excellent condition and remained so until fed out.

Plat No. 5.—Another cutting of oat hay over an area of 6 acres; yield, about 1 ton to the acre. Cut September 13 and 16, rainy weather intervening between the two dates. Tedded September 18 and 19 and placed in cocks September 20. Hauled to the hay shed September 29. Rain after cutting and before cocking, 0.74 inch;

after cocking and before hauling, nothing. Time on the field after cutting, sixteen days. This is the first cutting of hay so far mentioned that has been rained on to any considerable extent before being placed in cocks.

Plat No. 6.—An area of 3½ acres, oat hay; yield, 2 tons to the acre. Cut September 18 and 19. Tedded on September 23 and thrown into cocks September 25. Remained in the cock until hauled, October 1, 2, and 3. Conditions could hardly have been better than in this case, as there was no rainfall whatever from the time this hay was cut until it was hauled, an interval of fifteen days. Part of this was placed in the hay shed and the remainder stacked outside. It was in perfect condition and remained so both in the shed and the stack.

The season of 1905 was unusually favorable for the work.

EXPERIMENTS IN 1906.

Plat No. 7.—The same field of hay described in No. 1 of the 1905 experiments. Cut July 18 and 19; placed in cocks July 19; thrown out to dry July 21; recocked July 25. The cocks were built over July 27 in such a way that the greener portions were exposed and the drier parts were underneath. After this it rained so incessantly until it was time to begin cutting the grain hay that nothing further was done to this hay until it was boated home, October 5. In almost any other climate hay receiving treatment like this would be totally spoiled; in this case 40 per cent was in first-rate condition, the small cocks having so well withstood the rains of over two months.

Plat No. 8.—A cutting of native hay was made July 30 and 31, yielding about 2 tons. This hay was rained on before it could be placed in cocks and nothing further was done to it until August 8, when it was tedded. Was thrown into cocks August 9 and placed in four small stacks August 14. It was not perfectly dry when stacked, which was the reason for making small-sized stacks. The stacks were made large enough to turn water well and yet small enough so that they would not heat. The hay was very weedy, which made the curing more than ever difficult. It did not deteriorate any in quality after being stacked. Precipitation after cutting and before stacking, 0.97 inch; after stacking and before cocking, 0.08 inch.

Plat No. 9.—Oat hay; area, 3½ acres; yield, about 3 tons. Cut August 24; tedded August 26 and 27; cocked August 27, during a drizzle, the hay being thoroughly damp when put into cocks; thrown open for a few hours on September 3 and recocked again, as the weather again appeared threatening; again thrown out on the morning of September 6 and recocked on the evening of the same day; thrown open again September 15 and hauled September 17 and

18. Precipitation after cutting and before cocking, 0.10 inch; after cocking and before hauling, 1.89 inches. This was the poorest oat hay so far put up, but it was readily eaten by stock. It remained on the field twenty-five days after cutting.

Plat No. 10.—Oat hay; area, 3 acres; yield, 3 tons. Cut August 25; tedded August 28; tedded again August 30, after a shower of rain; raked and cocked August 31; thrown open on the morning of September 5 and recocked on the evening of the same day; hauled September 8 and 9. Precipitation after cutting and before cocking, 0.85 inch; after cocking and before hauling, 0.08 inch. On the field after cutting, sixteen days. Condition of hay excellent.

Plat No. 11.—Oat hay; area, 6 acres; yield, 12 tons. Cut August 31 and September 1; tedded September 4 and 5; thrown into cocks September 5; turned out to dry September 15 and 16; recocked September 17; hauled and stowed away in the hay shed September 18 and 19. In first rate condition and remained so. Precipitation after cutting and before cocking, 0.02 inch; after cocking and before hauling, 1.08 inches. Time on the field after cutting, eighteen days.

Plat No. 12.—Oat hay; area, 9 acres; yield, 18 tons. Cut on September 4, 5, and 6; tedded September 6 and 7; put into cocks on the afternoon of the latter day. These cocks were left undisturbed until September 19, when they were doubled in size. This was done by men working in pairs, throwing the tops of two cocks together and upon this as a base building the two cocks into one. This left the damp, uncured portion, which was formerly at the bottom of the two cocks, at the top of the new one, exposed to the sun and wind. By September 21 the hay was in condition to haul. The hauling was finished September 26. This hay was in excellent condition; better than any other put up this season. Precipitation after cutting and before cocking, nothing; after cocking and before hauling, 1.04 inches. Time on the field after cutting, seventeen days. Part of this hay was put in the hay shed and part stacked outside.

The season of 1906 was very rainy and unfavorable for haymaking.

NOTES AND CONCLUSIONS.

In the introduction to this bulletin the statement is made that an ordinary cock of hay would withstand the effects of rainy weather for a considerable length of time. Ample proof of this is given in the experiments. In the experiment on plat No. 7 small cocks of native hay were exposed to the rains for over two months during the rainy weather and 40 per cent of the hay was saved in good condition. This was a severer test than would be required under ordinary circumstances. It will be noted that this hay was cocked the next day and some of it the same day it was cut. The hay being

green, the cocks were necessarily small to prevent heating. There was a rainfall of 5.19 inches during the time that this hay was exposed to the weather.

On plat No. 11 cocks of oat hay withstood 1.08 inches of rain and the quality of the hay was not impaired in the least. On plat No. 12 oat hay was subjected to 1.04 inches of rain while in the cock, with no bad results. In this case it will also be noted that the hay was thrown into cocks within three days of cutting and was cured entirely in the cock.

From the experiment on plat No. 9 we deduce another interesting fact, i. e., that the cock loses its ability to turn water to a great extent after it has been thrown out and rebuilt. When the hay is first thrown together it is in a semigreen state and falls together compactly enough to almost perfectly exclude the rain, but it also to a great extent excludes the air. Evidently to carry on the curing process satisfactorily it is necessary that the cocks be loosened up. In the case mentioned the mistake was made of continually throwing the cocks out to dry and building them over again without increasing the size. This left them in a loosened condition and allowed the rain to enter, which accounts for the poor condition of this hay. On plat No. 12 the hay was loosened up without thereby increasing the danger of damage by rain, but rather decreasing it. The method employed in this case was the most successful used. This method consists in doubling the size of the cocks and, as much as possible, exposing the green, uncured portion and placing the drier portion at the bottom of the cock. In the instance just referred to, the hay had lain in the cock for twelve days previous to being handled as explained above. In two days it was in condition to be hauled. Under adverse conditions it had cured almost entirely in the cock.

Other instances of hay curing entirely or for the greater part in the cock indicate that this is the best method to be used in this latitude. In experiments on plats Nos. 1, 2, and 3 this is the case, but as the conditions in these instances were rather unusually favorable no positive conclusions can be drawn until this possibility be further tested.

In the season of 1905 some of the hay was rained on shortly after being cut; in one instance, plat No. 5, it was cut immediately following a shower and while it was still wet. It was noted that this hay dried out and cured without any appreciable decrease in the quality of either the color or aroma. In 1906 a better opportunity was afforded to test this point. On plat No. 8 a part of the hay was rained on immediately after being cut, while another part that had been cut twenty-four hours earlier was wet by the same shower. When this hay became dry enough to cock, the part that was greenest

at the time of the shower was in much the better condition. On plat No. 10 oat hay was wet continuously for five days without any noticeable deterioration in quality. On the other hand, if the hay had cured or started to cure and then became wet, the injury by the wettiing was at once apparent in the darkened color and the absence of aroma.

SUMMARY.

No hard and fast rules can be laid down for haymaking in Alaska any more than elsewhere, but a few rules, general in application, may be of value to Alaska pioneers. Experience at this station has suggested the following:

(1) All tools or implements of whatever nature that are to be used should be in repair, so that no time need be lost on that account during haying. All edge tools should be well sharpened.

(2) Begin cutting as soon as the hay is in condition. Oat hay will yield the greatest amount of total nutrients if cut in the milk stage. Native hay should be cut when in full bloom.

(3) Never cut more hay at a time than can be quickly handled by the available working force in case wet weather threatens.

(4) Shortly after cutting stir the hay with a fork or otherwise to leave it in a loosened condition, so that the air will pass freely through it.

(5) Use all possible means to prevent the hay from becoming wet while spread out on the ground if it is cured or partly cured. A wetting at this stage is certain to be detrimental. If the rain comes shortly after cutting, no great damage will be done.

(6) When the hay is in condition to be cocked, or when forced to cock it on account of bad weather, place in moderate-sized, well-made cocks. The size of the cocks will depend on the condition of the hay. The drier the hay the larger the cock. If the cocks are well made and of fair size, such rains as fall in this latitude will do no damage.

(7) After a wet spell of weather do not disturb the cocks until the surface has dried off completely. By this time the top portion of the cock will be found to be cured or partially so. Double the size of the cocks by placing the tops of two cocks on the ground and on this build one cock of the two. This will leave the drier portion at the bottom, and the damp, uncured portion will be exposed to the sun and wind.

(8) In this condition the process of curing will go on steadily, and the hay is in no danger of spoiling. Do not haul to the shed or place in stack until there is positively no danger of heating. The shortest time in which hay has cured well here is ten days and the longest time twenty-five days.

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